Cisco Catalyst 6500 Series and Cisco 7600 Series Network Analysis Module 4.1

In today's business reality, distributed enterprises heavily rely on applications for communication, collaboration, and effective day-to-day operations. At the same time, IT is challenged with managing application delivery in a rapidly changing environment. The number of business applications is growing, application architectures are increasingly complex, application traffic is proliferating, and traffic patterns are difficult to predict. In addition, driven by security, regulatory, and economic considerations, enterprises are embracing data center consolidation, desktop virtualization, and network and application convergence to increase the value of their IT investments. This demands comprehensive application and network visibility to successfully deliver disparate applications in a complex IT environment.

Cisco® Catalyst® 6500 Series and Cisco 7600 Series Network Analysis Module (NAM) is a powerful network-aware performance assurance solution that delivers unparalleled visibility into application and network performance to help ensure the consistent and efficient delivery of applications and services to the end users.

Product Overview

Cisco Catalyst 6500 Series and Cisco 7600 Series NAM combines performance monitoring, traffic analysis, and advanced troubleshooting to meet the performance assurance needs of today's dynamic, evolving enterprises. It is designed to provide deeper insight at both the network and application levels. It offers real-time visibility into the applications running on the network, how the network resources are being utilized, and how the end users experience these applications. The visibility also allows IT to effectively use control and optimization mechanisms such as quality of service (QoS) and Cisco Wide Area Application Services (WAAS) to improve the performance of applications and services.

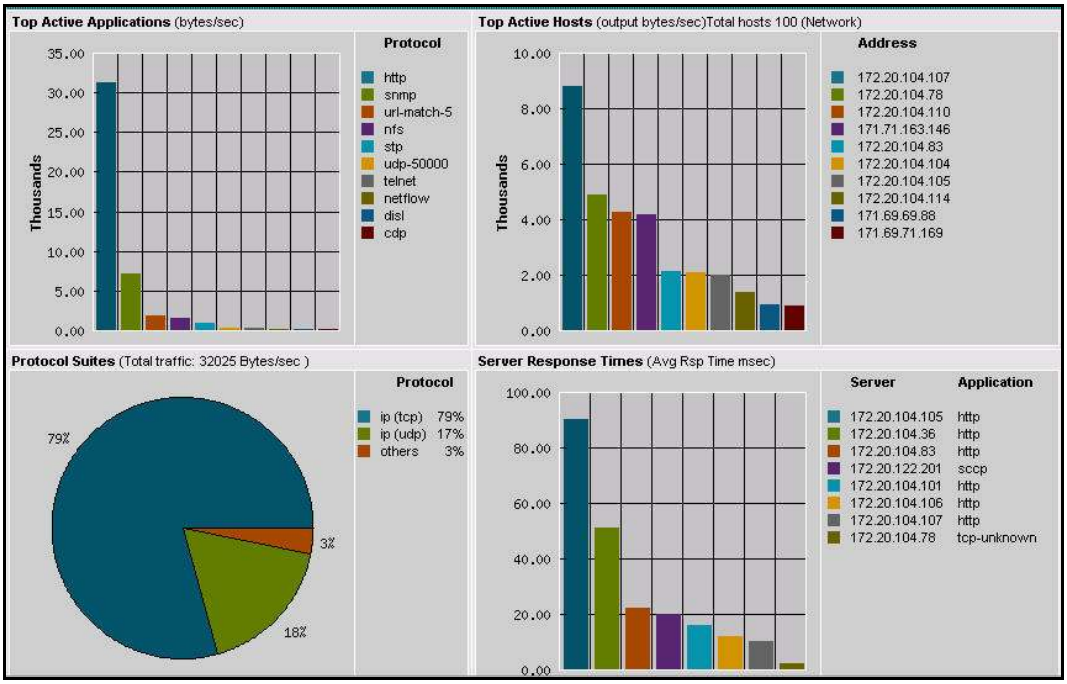
Figure 1. Cisco Catalyst 6500 Series and Cisco 7600 Series Network Analysis Modules, NAM-1 and NAM-2

The unique design of Cisco® NAM combines a rich set of embedded data collection and analysis capabilities with a remotely accessible, web-based management console, all of which reside on a single blade (Figure 1) that is easily installed into the Cisco Catalyst 6500 Series Switch or the Cisco 7600 Series Router.

As an integrated services module, Cisco NAM uses a rich set of Catalyst 6500 Series Switch and Cisco 7600 Series Router features to collect both LAN and WAN traffic for analysis. Using the Switched Port Analyzer (SPAN) feature, Cisco NAM can monitor traffic from physical ports, virtual LANs (VLANs), or Cisco EtherChannel connections of the local switch or router. Using VLAN access control list (VACL)–based captures, traffic can be filtered before it is sent to Cisco NAM to support the selective monitoring of large amounts of traffic or the gathering of traffic from WAN interfaces. In addition, Cisco NAM can consume NetFlow Data Export (NDE) from local and remote devices to provide both real-time and historical traffic usage data. Cisco NAM can also use the Remote SPAN (RSPAN) or Encapsulated Remote SPAN (ERSPAN) features of the devices to extend troubleshooting to remote parts of the network. By supporting these Catalyst 6500 Series and Cisco 7600 Series features, Cisco NAM offers more ways to see and understand what's happening on the network. Cisco NAM offers extensive monitoring capabilities to meet diverse network analysis needs in scalable switching and routing environments.

Cisco NAM includes an embedded, web-based Traffic Analyzer GUI (Figure 2), which provides quick access to the configuration menus and application performance views for voice, video, and TCP-based applications. It also provides traffic analysis views with the detailed information on VLANs, Differentiated Services (DiffServ), hosts, conversation pairs, and application usage that is essential for managing effective and reliable delivery of applications. The GUI can be accessed from any desktop, eliminating the need to send personnel to remote sites or haul large amounts of data to the central site. To enhance security, role-based access can be assigned and web-browser access can be secured with up to 168-bit encryption.

Figure 2. Web-Based Traffic Monitoring with the Embedded Cisco NAM Traffic Analyzer



Features and Benefits

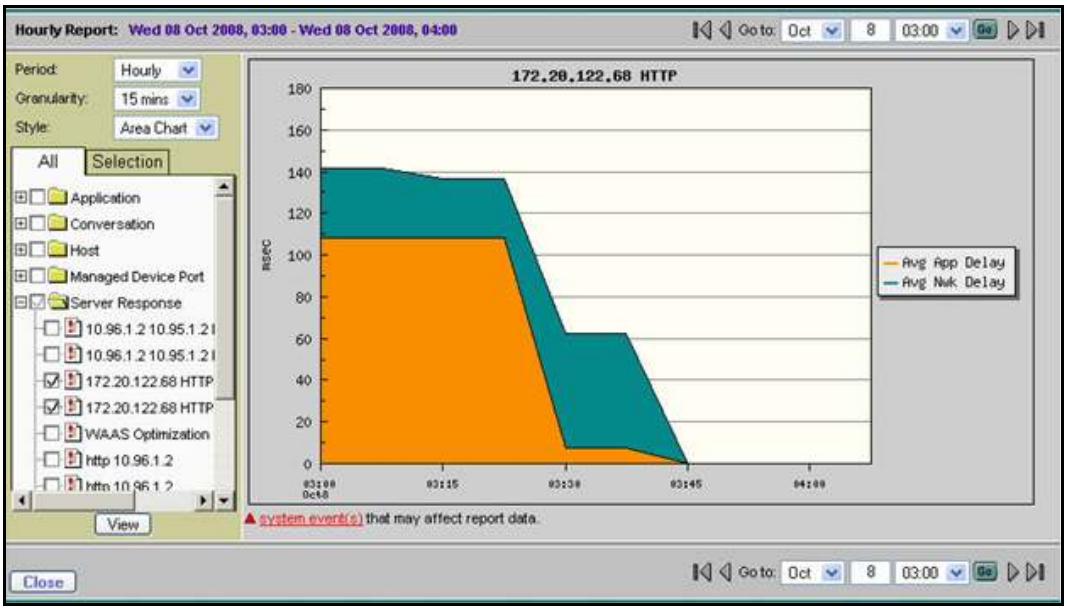
Intelligent Application Performance Analytics

Cisco Catalyst 6500 Series and Cisco 7600 Series NAM provides comprehensive intelligent application performance (IAP) measurements to accurately characterize end-user experience. It analyzes the TCP-based client/server messages to provide transaction and session-based statistics. Intelligence derived from integrated application and network visibility helps to isolate application problems to the network, the application, or the server. It also helps to quickly analyze the root cause and resolve problems minimizing any impact to the end users.

The Cisco NAM GUI allows network administrators to correlate the end-user experience with network performance metrics, such as network delay, round-trip time, retransmission time, and so on, to identify the cause of degradation. For example, the source of network latency affecting the end-user experience can be identified by analyzing network delay metrics, namely client network delay, server network delay, and network delay. Similarly, server resource issues can be identified by network metrics such as application delay and server response time.

Figure 3 provides an example of the application response time report for an HTTP application. The report shows reduction in the application delay after the administrator restarted a hung process on the application server.

Figure 3. Troubleshooting Application Response Time



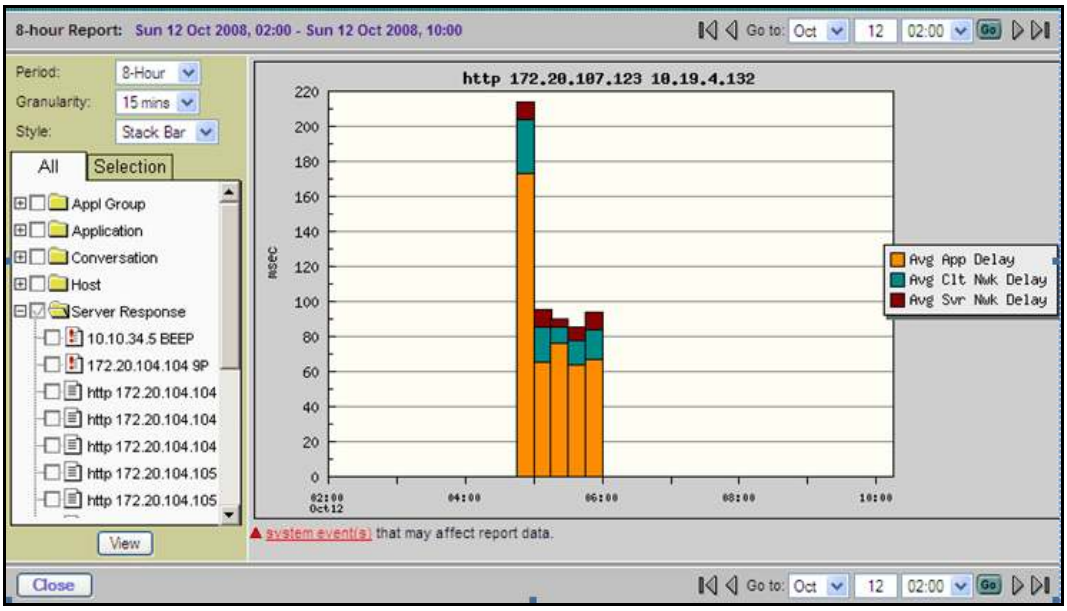
The application performance data can also be analyzed over time to identify trends, track service-level objectives, and establish meaningful thresholds to receive proactive actionable alerts. Thus, degradations in application performance can be preempted, and the underlying cause can be promptly investigated and resolved before it affects the end user. The changes in network and application usage can also be correlated with fluctuations in response times. The capability allows administrators to assess and predict the impact of new application rollouts, WAN optimization, or changes in user populations on application performance.

Visibility into WAN-Optimized Networks

Cisco Wide Area Application Services is a powerful application acceleration and WAN optimization solution that optimizes the performance of TCP-based applications operating in a WAN environment. This optimization allows IT organizations to consolidate costly branch-office servers and storage in centrally managed data centers and to deploy new applications directly from the data center while offering LAN-like application performance for any employee, regardless of location.

In a typical WAN-optimized deployment, the interception of application traffic obscures the response time, data transfer time, and other performance metrics; hence the traditional monitoring techniques fail to accurately characterize the impact of optimization.

Figure 4. Assessing the Impact of Cisco WAAS Optimization



Cisco Catalyst 6500 Series and Cisco 7600 Series NAM uses the built-in instrumentation on the Wide-Area Application Engine devices as additional data sources to gather flow data for optimized and passthrough traffic to provide end-to-end application performance visibility in a Cisco WAAS environment. It measures and reports on application response time, transaction time, bandwidth usage, and LAN/WAN data throughput among other performance metrics. As a result, it can accurately quantify the impact of Cisco WAAS optimization as illustrated in Figure 4.

Cisco NAM can also help to assess which applications would benefit the most from deploying WAN optimization and application acceleration services. Analyzing the response time data over a period of time, the administrator can identify the applications where the response time improvement can be significant with an increase in available bandwidth. In addition, understanding the traffic mix provides a sense of how much compression could be achieved with Cisco WAAS based on the type of applications in the mix.

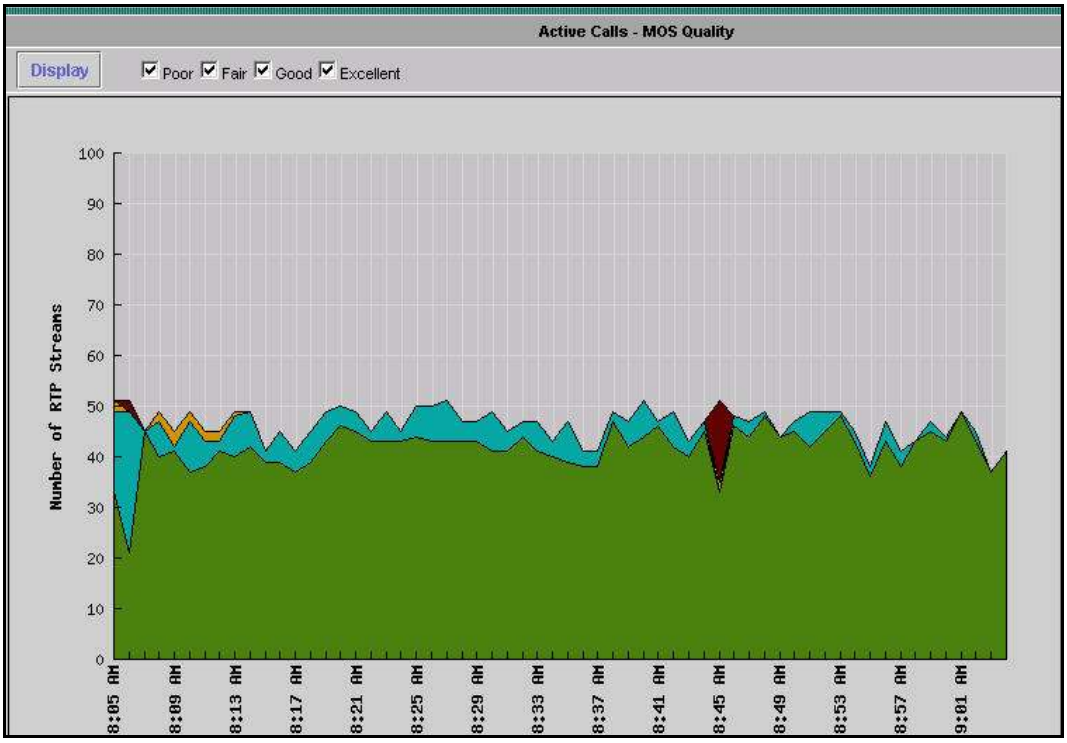
Finally, Cisco NAM can be used to provide real-time visibility for ongoing optimization improvements, to monitor optimized and nonoptimized applications, and to troubleshoot any performance degradation issues.

Superior Voice Quality Monitoring

Cisco NAM offers real-time voice quality monitoring using Mean Opinion Score (MOS) and key performance indicators such as jitter and packet loss. It calculates MOS based on R-Factor (ITU-T G.107 Recommendations). It also integrates with Cisco Unified Communications Management Suite to deliver an enterprisewide voice management solution. Cisco NAM offers scalable and flexible deployment options complementing Cisco Unified Communications Management Suite with networkwide visibility allowing enforcement of end-to-end service-level objectives.

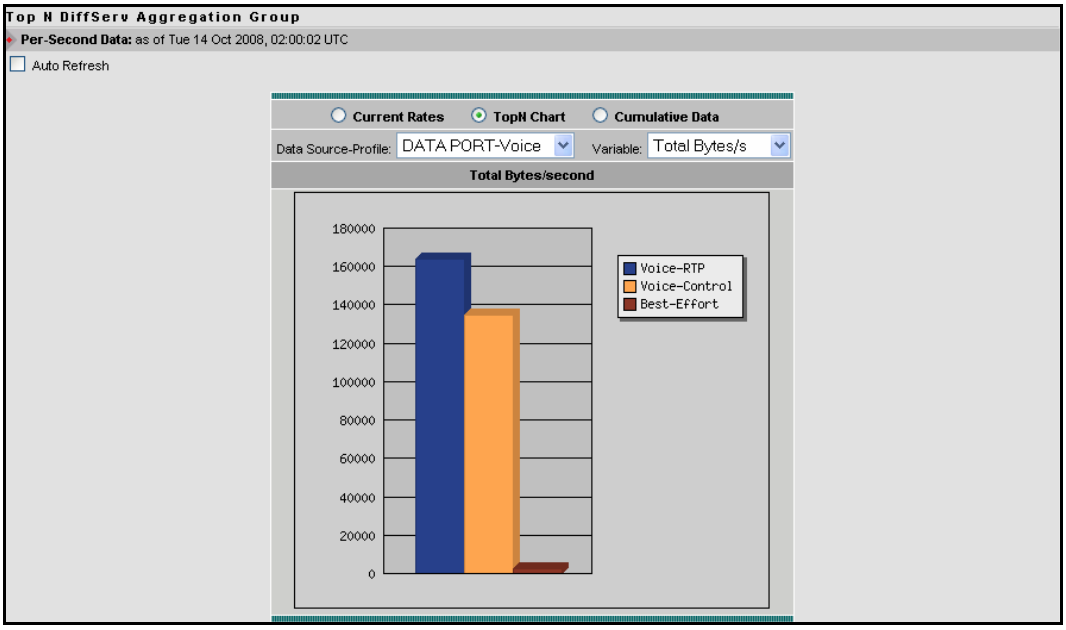
Figure 5 presents the last 60-minute view summarizing the voice quality for the active calls. The interface allows the user to filter the data by quality grade (Poor, Fair, Good, and Excellent) and identify any anomalous behavior.

Figure 5. Monitoring Voice Quality (MOS) for Active Calls



Cisco NAM combines superior voice characterization with real-time troubleshooting capabilities to help improve the quality of voice services delivered to the end user. It can generate proactive alerts to notify of possible voice quality degradations. Acting on the alerts, the administrator can rapidly pinpoint the degraded voice stream and correlate it with network performance indicators such as jitter and packet loss to analyze the underlying cause. Voice performance issues can be further investigated using the traffic analysis capabilities of Cisco NAM. The administrator can use Cisco NAM's DiffServ monitoring capabilities (Figure 6) to monitor traffic by differentiated services code point (DSCP) allocations defined by QoS policies. This allows administrators to detect whether voice is misclassified or whether non-business-critical traffic is contending with voice for network resources, hence affecting voice quality.

Figure 6. Analyzing QoS Using DSMON



Visibility into Virtual Switch System Deployments

The Cisco Catalyst 6500 Series Virtual Switching System (VSS) 1440 is a feature on the Cisco Catalyst 6500 Series Switches that allows clustering of two physical chassis into a single logically managed entity. It simplifies operational manageability while delivering high availability and optimal network resource usage. VSS helps enable network system virtualization in data center server access as well as campus and data center distribution/core layer designs.

Cisco NAM can be deployed in both virtual switches in a VSS 1440 environment. Either of the two NAMs can monitor traffic on all switch ports of both virtual switches. It reduces the management overhead and simplifies monitoring of application performance, network traffic, and switch health, thereby improving the overall operational efficiency.

Virtualized Campus Monitoring

Network virtualization for the campus is a cohesive, extensible architecture to logically partition the network infrastructure. It simplifies network operations and reduces costs while increasing flexibility and agility and enhancing productivity. In today's evolved networking environments, typical campus network designs use a mix of Layer 2 switching technologies at the network edge (access layer) and Layer 3 routing technologies at the network core (distribution and core layers). Thus, network virtualization can be achieved at the network access layer (Layer 2) by means of VLANs and at the network core (Layer 3) by using Generic Routing Encapsulation (GRE) tunnels, Virtual Route Forwarding (VRF)–Lite, and Multiprotocol Label Switching (MPLS)–based Layer 3 VPNs to partition the routed domain and thus achieve scalable end-to-end virtualization.

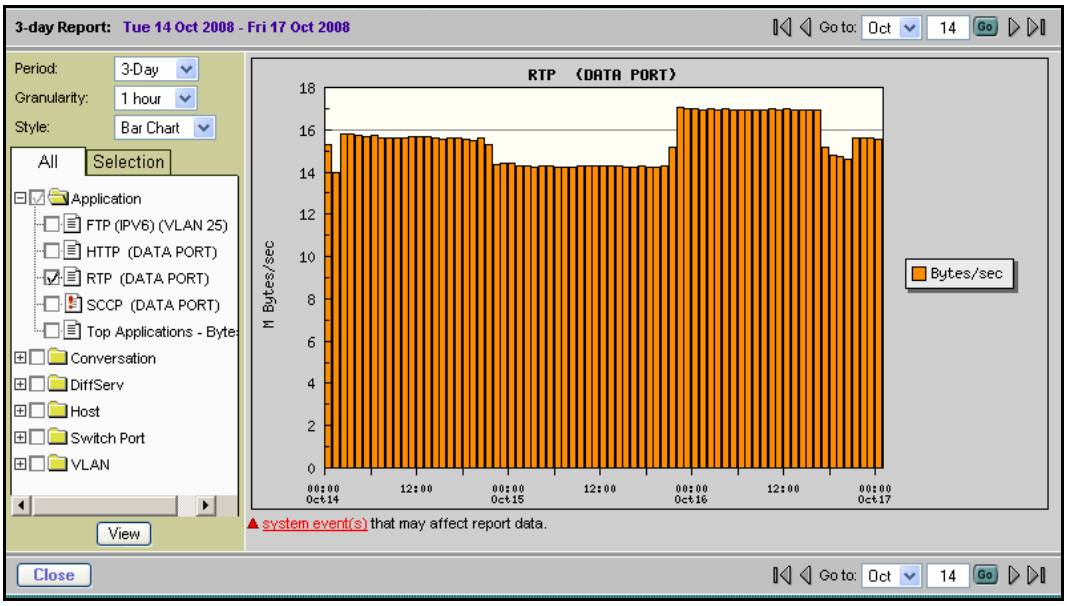
Cisco NAM monitors traffic flowing through the virtualized campus. For designs using MPLS VPNs, Cisco NAM can identify, monitor, and capture MPLS VPN traffic. Because Cisco NAM can present detailed "before and after" traffic information, it can ease the deployment of a virtualized campus design by facilitating the critical planning and management activities required to help ensure a smooth transition.

Network and Application Usage Analysis

One of the foundations of Cisco NAM is its ability to look inside the live packet to gather information on applications, hosts, and conversations. Application monitoring identifies every application that has consumed bandwidth, reports how much bandwidth has been consumed, and detects which hosts are using which applications. Host and conversation-pair monitoring provides bandwidth consumption per host and shows which hosts are talking to each other along with the amount of traffic each host is generating. Monitoring applications, hosts, and conversations can help to proactively spot bottlenecks before the network suffers blows to performance and availability. It can also help improve the consistency and quality of both individual and overall network services since these metrics reveal usage patterns for users as well as for router and switch, interface, server, and application resources.

Besides delivering a real-time snapshot of bandwidth usage and consumption, Cisco NAM also delivers a continuous historical view (Figure 7) of how the bandwidth was used so the network administrator can quickly decide when and where to make changes in network resources. Data can also be collected over a select period of time and then analyzed after the event to discover when an anomaly has occurred so it can be quickly resolved.

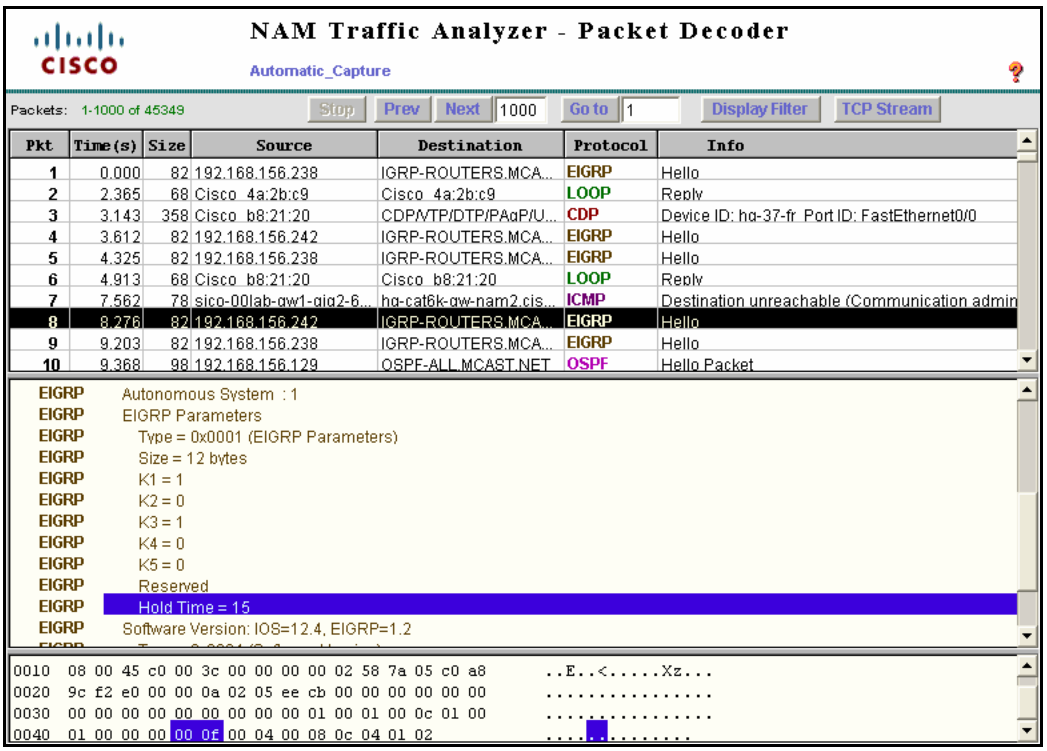
Figure 7. Highly Granular Analysis of Real-time Transport Protocol (RTP) Traffic on the Network



Advanced Troubleshooting

On detecting degradation in performance, Cisco NAM can automatically trigger packet capture to help investigate and analyze the root cause. Captures can be performed using a web browser from any desktop, and packet decodes can be viewed through the Traffic Analyzer GUI. Cisco NAM's capture and decode capability provides depth and insight into data analysis using trigger-based captures, filters, decodes, and a capture analysis toolset to quickly pinpoint and resolve problem areas (Figure 8).

Figure 8. Capturing and Decoding Packets with Cisco NAM



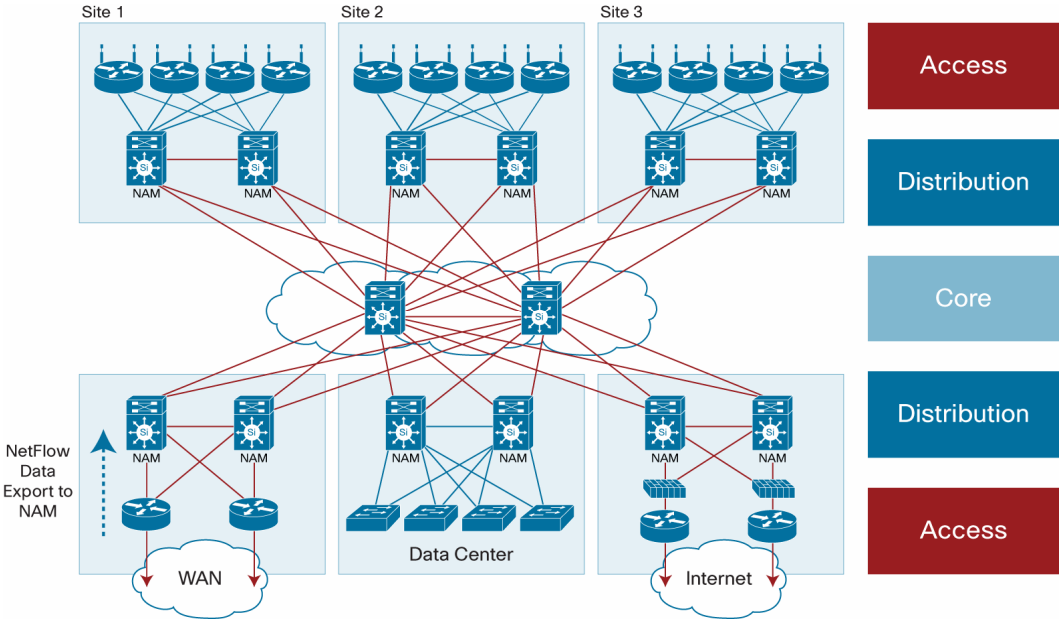
Quality of Service Analysis

Cisco NAM supports both the planning and management of quality of service deployments for voice, video, and other critical IP-based services. It supports the Differentiated Services Monitoring (DSMON) MIB, which monitors traffic by DSCP allocations defined by QoS policies. Using the Cisco NAM DiffServ monitoring capabilities, applications, hosts, and conversations participating in each grouping of DiffServ classes can be identified. This information can be used to validate and tune planning assumptions and QoS allocations. It can also be used to detect incorrectly marked or unauthorized traffic.

Flexible Deployment Scenarios

Cisco NAM can be deployed in the Cisco Catalyst 6500 Series at LAN aggregation points (for example, in the core and distribution layers) for proactive monitoring, at service points (for example, in data centers, or Cisco Unified Communications Manager clusters in IP telephony networks) where performance monitoring is critical, and at important access points (critical clients, IP phone closets) where quick troubleshooting is required. It can also be deployed in Cisco 7600 Series Routers at WAN edges or in Catalyst 6500 Series Switches connected to WAN routers. Figure 9 highlights a model deployment of Cisco NAM in the campus for performance monitoring.

Figure 9. Deploying Cisco NAMs for Performance Monitoring in the Campus Network



Bring It All Together Your Way

As flexible advanced Cisco instrumentation, the Cisco NAMs can export computed NAM data to third-party and homegrown applications to meet end-to-end performance reporting needs. For example, Cisco NAMs can export application response time information to NetQoS SuperAgent for consolidated networkwide reporting. The comprehensive performance overview provided by NetQoS SuperAgent complements the granular performance visibility offered by Cisco NAMs to help enable you to monitor how applications are being delivered enterprisewide, yet isolate and resolve delivery problems proactively and promptly at their source.

Product Specifications

Table 1 provides the specifications for the Cisco Catalyst 6500 Series and Cisco 7600 Series NAM.

Table 1. Cisco Catalyst 6500 Series and Cisco 7600 Series NAM Specifications

Feature	Description
NAM-1 hardware architecture	• High-performance dual processor architecture offering sub–Gigabit Ethernet monitoring performance, 2 GB RAM, and a 250 GB SATA hard disk drive • Two data-collection interfaces to backplane (one for SPAN/VACL data sources, one for NetFlow) • Second-generation fabric-enabled platform with interface to both bus- and crossbar-based architectures
NAM-2 hardware architecture	• Extra high-performance dual processor architecture with hardware-based packet acceleration offering up to Gigabit Ethernet monitoring performance, 2 GB RAM, and a 250 GB SATA hard disk drive • Three data-collection interfaces to backplane (two for SPAN/VACL data sources, which can be used independently or together, and one for NetFlow) • Second-generation fabric-enabled platform with interface to both bus- and crossbar-based architectures
Supported platforms	• NAM-1 and NAM-2 can be deployed in a slot in Cisco Catalyst 6500 and 6000 Series Switches and Cisco 7600 Series Routers (both bus- and crossbar [fabric]-based architectures); multiple NAMs can be placed in the same chassis. • Supported with Cisco IOS® Software or Cisco Catalyst Operating System
Supported topologies and data sources	• LAN: SPAN, RSPAN, VACL-based captures, NetFlow (versions 1, 5, 6, 7, 8, and 9) • WAN: NetFlow (versions 1, 5, 6, 7, 8, and 9) from local and remote devices, VACL-based captures for FlexWAN/Optical Service Module (OSM) interfaces (Cisco IOS Software only)
Supported interfaces	• HTTP/HTTPS with embedded web-based Cisco NAM Traffic Analyzer • Simple Network Management Protocol Version 1 (SNMPv1) and v2c, with standards-based applications

NAM Traffic Analyzer	• Embedded in Cisco NAM Software 4.1 • Web-based: Requires Microsoft Internet Explorer 7.0 or Firefox 3.0; supports both English and Japanese versions of browsers • Supports Secure Sockets Layer (SSL) security with up to 168-bit encryption • Role-based user authorization and authentication locally or using TACACS+ • Real-time and historical statistics (up to 100 days) on LAN and WAN traffic and network-based services
Cisco NAM Software 4.1	• Supports the following Cisco Catalyst 6500 Series and Cisco 7600 Series NAMs: 1. NAM-1: WS-SVC-NAM-1 2. NAM-1: WS-SVC-NAM-1-250S 3. NAM-2: WS-SVC-NAM-2 4. NAM-2: WS-SVC-NAM-2-250S • Supported with Cisco IOS Software Release 12.2(18)SXF (minimum) or Cisco Catalyst Operating System 8.2(1) (minimum). Refer to the NAM 4.1 Release Notes for more details regarding supported system software
MIBs	The Cisco NAMs are standards-compliant and support Remote Monitoring (RMON) and RMON2 MIBs, as well as several extensions. Major MIB groups supported in the Cisco NAMs are: • MIB-II (RFC 1213) – All groups except Exterior Gateway Protocol (EGP) and transmission • RMON (RFC 2819) • RMON2 (RFC 2021) • SMON (RFC 2613) – DatasourceCaps and smonStats • DSMON (RFC 3287) • HC-RMON (RFC 3273) • Application Response Time
Protocols	Cisco NAM provides RMON2 statistics on hundreds of unique protocols, including those defined in RFC 2896, and several Cisco proprietary protocols. Cisco NAM automatically detects unknown protocols. Users have flexibility to customize the protocol directory by defining protocols on a single port or on a range of ports. Protocols supported include (this list is not all-inclusive): • TCP and User Datagram Protocol (UDP) over IP including IPv6 • HTTP and HTTPS • Voice over IP (VoIP) including Skinny Client Control Protocol (SCCP), Real-time Transport Protocol/Real-Time Control Protocol (RTP/RTCP), Media Gateway Control Protocol (MGCP), and Session Initiation Protocol (SIP) • SigTran and Mobile IP protocols including GPRS Tunneling Protocol (GTP) • Storage area network (SAN) protocols including Fibre Channel over TCP/IP • AppleTalk, DECnet, Novell, Microsoft • Database protocols, including Oracle and Sybase • Peer-to-peer protocols such as Gnutella, Fasttrack, and winmix • Bridge and router protocols • Cisco proprietary protocols • Unknown protocols by TCP/UDP ports, Remote Procedure Call (RPC) program numbers, and so on
Physical dimensions	Dimensions (H x W x D): 1.2 x 14.4 x 16 inches (3.0 x 35.6 x 40.6 centimeters); occupies one slot in the chassis
Operating environment	• Operating temperature: 32 to 104ºF (0 to 40ºC) • Nonoperating and storage temperature: –40 to 158ºF (–40 to 70ºC) • Operating relative humidity: 10% to 90% (noncondensing) • Nonoperating relative humidity: 5% to 95% (noncondensing) • Operating and nonoperating altitude: Sea level to 10,000 feet (3050 meters)
Approvals and compliance	• Regulatory: CE Marking (89/366/EEC and 73/23/EEC) • Safety: UL 1950; CSA-C22.2 No. 950, EN60950, IEC 60950 • EMC: FCC Part 15 (CFR 47) Class A, ICES-003 Class A, EN 55022 Class A, CISPR 22 Class A, AS/NZS CISPR 22 Class A, VCCI Class A, EN 55024, EN300 386, EN 50082-1, EN 61000-3-2, EN 61000-3-3, EN 61000-6-1

Ordering Information

Cisco Catalyst 6500 Series and Cisco 7600 Series NAM is available for purchase through regular Cisco sales and distribution channels worldwide. To place an order, visit the Cisco Ordering Homepage. To download software, visit the Cisco Software Center. Table 2 provides ordering information for Cisco NAM.

Table 2. Ordering Information for Cisco Catalyst 6500 Series and Cisco 7600 Series NAM

Product Name	Part Number
Cisco Catalyst 6500 Series and Cisco 7600 Series Network Analysis Module-1	WS-SVC-NAM-1-250S
Cisco Catalyst 6500 Series and Cisco 7600 Series Network Analysis Module-1 (Spare)	WS-SVC-NAM-1-250S=
Cisco Catalyst 6500 Series and Cisco 7600 Series Network Analysis Module-2	WS-SVC-NAM-2-250S
Cisco Catalyst 6500 Series and Cisco 7600 Series Network Analysis Module-2 (Spare)	WS-SVC-NAM-2-250S=
Field-Installable Memory Upgrade Kit (2GB) for WS-SVC-NAM-1 and WS-SVC-NAM-2	MEM-C6KNAM-2GB=
Cisco Catalyst 6500 Series and Cisco 7600 Series Network Analysis Module Software 4.1	SC-SVC-NAM-4.1

Service and Support

Using the Cisco Lifecycle Services approach, Cisco and its partners provide a broad portfolio of end-to-end services and support that can help increase your network's business value and return on investment. This approach defines the minimum set of activities needed, by technology and by network complexity, to help you successfully deploy and operate Cisco technologies and optimize their performance throughout the lifecycle of your network.

For More Information

For more information about Cisco Catalyst 6500 Series and Cisco 7600 Series NAM, visit http://www.cisco.com/go/nam, contact your local account representative, or email the Cisco NAM product marketing group at nam-info@cisco.com.

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